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STUDENT REPORT

AN APPLICATION OF THE PRINCIPLES OF WAR TO THE SCHWEINFURT RAIDS ON 17 AUGUST 1943 & 14 OCTOBER 1943

MAJOR THOMAS J. GRIFFITH 84-1090

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Provides a historical look at the use of daylight precision bombing by American bombers against the ball-bearing factories at Schweinfurt, Germany, on 17 August 1943 and 14 October 1943. The principles of war from AFM 1-1, Basic Aerospace Doctrine of the United States Air Force, are used to analyze the strengths and weaknesses of the American and German efforts during these operations.

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PREFACE

History provides a valuable classroom for learning about the art and science of warfighting. The experiences of history, both good and bad, are receiving renewed emphasis in the professional military education programs of the Air Force. Recognizing this, an analysis of great air battles provides lessons that can be of value to today's airmen. The technology has changed, but the basic principles still apply.

This paper looks at a great air battle of World War II. The battle pits the heavy bombers of the U.S. Eighth Air Force against the German Luftwaffe fighters defending the ball-bearing factories at Schweinfurt, Germany. Applying the principles of war from AFM 1-1, Basic Aerospace Doctrine of the United States Air Force, provides insight into the strengths and weaknesses of the forces involved. Additionally, an analysis of the battle demonstrates the importance of understanding the principles of war and their value in warfighting.

The author expresses appreciation to Major (Lieutenant Colonel selectee) Robert L. Gregory, ACSC/EDOW, for the motivation and guidance provided during this project.

ABOUT THE AUTHOR

Major Thomas J. Griffith has experience as an OV-10 Forward Air Controller in Southeast Asia, a UPT Instructor Pilot/Flight Examiner and a base level Personnel Officer. He was a JUVAT fighter pilot in the F-4D, and his most recent assignment was in the F-4E. Major Griffith has a BBA in Personnel Management from Texas Tech and a Master's Degree in Finance from Oklahoma State University. He is a graduate of Squadron Officer School and Air Command and Staff College.

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Chapter One

THE BATTLE

In 1941, under the leadership of then Lt General H. H. "Hap" Arnold, Chief of the Army Air Corps, the Air War Plans Division (AWPD) of the Army Air Corps began developing the strategy to be used by American air power during World War II. (6:7-11) Falling back on their experience as students and instructors at the Air Corps Tactical School, the planners (Colonel Harold L. George, Lieutenant Colonel Kenneth Walker, Major Lawrence S. Kuter and Major Haywood S. Hansell, Jr.) employed a theory using strategic bombardment to destroy an enemy's warfighting capability. Large formations of heavy bombers flying during the daytime at high altitude would use precision bombsights to identify and destroy pinpoint targets. (6:7) At that time, it was believed that fighters could not be built with sufficient range to escort the bombers. Therefore, the bombers were heavily armed and depended upon the defensive firepower of massive formations for protection. (6:7,9) This firm belief in heavy bombers laid the foundation for the American use of daylight precision bombardment to defeat Germany.

The American plan developed for the destruction of German warfighting capability was the A.W.P.D.-1 plan. This plan and

its subsequent revisions established the need for air superiority prior to an allied invasion of the European continent.

> The plan acknowledged that the German air force, especially the German fighter force, would have to be defeated before an invasion could be contemplated, and that such a defeat might also be necessary to the prosecution of the air offensive itself. Hence, defeat of the German air force was accorded first priority among air objectives--"an intermediate objective of overriding importance," to take precedence over the Primary Air Objectives themselves. (5:vii)

The American and British political and military leaders believed that the destruction of the German air force required attacking the industrial base of the German economy. Both countries supported the use of strategic bombing as a means of defeating Germany. But they disagreed upon the method of implementation. The British favored night "area" bombing while the Americans preferred daylight "precision" bombing. (1:41-42)

The British bombing effort and preference for night operations were based upon their earlier experience with the German bombing offensive against England. (1:41)

> They had whipped the German air force at its peak in daylight defense, and had demonstrated beyond all question the inability of the Luftwaffe to maintain daylight raids. The Germans had, however, proven themselves capable, even with a sorely weakened bomber

> force, of inflicting punishing damage and destruction upon England under the mantle of darkness. For these reasons, and because of their firm belief that daylight attacks were suicidal in the face of the vigorous and highly capable German fighter force, the British disdained the daylight bombing campaign. (1:41)

The Royal Air Force (RAF) used the cover of night to conduct their "area" bombings--raids which included the bombing of ". . .the factories and the dwellings of the factory workers." (4:254) The darkness also served as a means of defense for the lightly armed British bombers that had ". . .failed in daylight missions against the continent." (2:vi; 4:255) This British experience with the results of night versus daylight bombing left them skeptical of the ability of the Americans to succeed with their plan for daylight precision bombing. (2:vi)

However, Eighth Air Force was determined to prove the American strategy of daylight precision bombing. ". . .the Army Air Force's program called for a sustained daylight bombing campaign, carried out with high precision, which rather than attempting to destroy entire cities in saturation raids, would wreck carefully chosen industrial objectives." (1:41) Heavily armed B-17 "Flying Fortresses" and B-24 "Liberators" equipped with the highly accurate Norden bomb sight provided the thrust to the argument for daylight precision bombing. (2:26)

In January 1943, the Combined Chiefs of Staff (CCS), composed of Allied military leaders, and the Allied Chiefs of

State met at Casablanca, Morocco, to plan the Allied strategy for the war. During the Casablanca Conference, the CCS confirmed that ". . .an invasion of the western European continent could not be launched in force until at least the spring of 1944." (6:14) In conjunction with this determination, the CCS decided that the Eighth Air Force and the RAF should prepare the way for the invasion by launching a ". . .sustained bomber offensive from bases in the United Kingdom." (6:14) The Combined Bomber Offensive (CBO) Plan evolved from the Casablanca Conference and established a combined bombing effort by the U.S. Army Air Forces and the Royal Air Force, each operating on the basis of its own capabilities and concepts. (1:34) The Royal Air Force would conduct night bombing missions against strategic areas while the Army Air Force would conduct precision bombing against specific targets. (1:34) In June 1943, the CBO was implemented by a directive from the Chief of the Air Service to the Commanding General of Eighth Air Force, General Ira C. Eaker. The directive stated that:

> . . .first priority in the operation of British and American bombers based in the United Kingdom shall be accorded to the attack of German fighter forces and the industry upon which they depend. (11:10)

This marked the beginning of the Eighth Air Force's counter-air offensive against the German Luftwaffe. (11:2)

Preparation for the counter-air offensive identified the objectives of assuring ". . .freedom for bombardment operations

by the strategic air forces. . ." and assuring ". . .the necessary air superiority to the tactical air forces to permit major land operations on the continent." (11:7) Furthermore, the planners identified five target systems for the Eighth Air Force and RAF bombing campaign. Given in their order of stated priority, those targets were: ball bearings, petroleum production, synthetic rubber plants, rubber tire plants, and military transport plants. (11:17) These targets were listed in the CBO Plan as the "principal objectives." However, the overriding objective of this plan was the destruction of the German Air Force, ". . .particularly its fighter strength." (6:15) The CBO Plan noted that ". . .if the growth of the German fighter strength is not arrested quickly, it may become literally impossible to carry out the destruction planned." (6:15) A report on the status of the Combined Bomber Offensive prepared for General Eaker, dated 7 August 1943, noted a build up of German fighters on the Western Front. In January 1943 the German Luftwaffe had 39 percent of its first line strength of single-engine fighters on the Western Front, with 36 percent on the Russian Front and 25 percent on the Mediterranean Front. By July 1943, the Luftwaffe had increased its single-engine fighter force on the Western Front to 55 percent of its first line strength with 26 percent on the Eastern Front and 19 percent in the Mediterranean. (10:8) This build up of fighter strength by the Germans reinforced the overriding objective of the CBO Plan--the destruction of the German Luftwaffe. Allied planners

considered ball bearings to be a critical resource for German aircraft production capability.

British planners at the Ministry of Economic Warfare (M.E.W.) learned early in the war the critical impact of ball bearings on aircraft production. The M.E.W. planners remembered the results of a successful German attack on a ball-bearing plant at Chelmsford, just northeast of London, early in the war. (2:236)

> The Germans had hit a plant that specialized in bearings for aircraft production, causing enough damage to delay the flow of Spitfire fighters and Lancaster bombers. They created a ball bearing shortage in England that was overcome only after a large purchase from the United States. (2:36)

The more the target analysts studied the situation, the greater the perspective they gained of the ball-bearing industries' importance to Germany's war fighting capacity. Ball bearings were an integral means of reducing friction in machinery, vehicles, and weapon systems. Just the aircraft production industry alone required ". . .many varieties of highly specialized bearings." (1:44)

> Almost every aircraft had a specific bearings need for propellors, superchargers, pump drives, gear systems, reduction gears, as well as bomb sights, automatic pilots, and other control instruments. The aircraft industry without a continual supply of antifriction

bearings would literally be crippled to a state of impotence. (1:44)

In light of these many uses, M.E.W. judged the ball-bearing industry a bottleneck --". . .an industry upon which all other industries depended." (2:237) The ball-bearing industry was considered the best of the bottleneck industries to pick for destruction because the bulk of ball-bearing production was produced at a single location--Schweinfurt. (2:237)

In June 1943, five plants in Schweinfurt, located in northeastern Bavaria, produced 52 percent of Germany's ball bearings. (2:237) The British Ministry of Economic Warfare believed that ". . .if the partial destruction of one ball-bearing factory could hurt England. . .,the destruction of five plants at Schweinfurt could be catastrophic for the Germans." (2:237) Eighth Air Force intelligence noted that "Ball bearings. . .were exceedingly attractive as a method of striking a serious blow at German war economy as a whole, without diverting any major effort from the current task of assuring air superiority." (11:18)

The American Eighth Air Force saw Schweinfurt as an ideal application for daylight precision bombing.

> The industry stood in urgent need of depth and decentralization for its defense; and in the lack of these things, it was unusually vulnerable to being crippled by only a few devastating attacks. Its disruption could at an early date seriously affect

aircraft production--notably fighters, a primary objective of the Eighth. (1:45)

By late June 1943, Eighth Air Force planners began to work out the details for a mission against Schweinfurt, ". . .which was scheduled to take place on the first day of favorable weather after 17 July 1943." (2:238) However, weather was not the only problem facing the Commander of Eighth Air Force.

During the first half of 1943, the Eighth Air Force began expanding its operations into Germany. These "tentative raids" into Germany ". . .became increasingly expensive as the opposition increased." (6:15)

> German air strength in the west [was] being augmented by units moved to France and northern Germany from the Mediterranean and Russian fronts. As the numbers of German defensive aircraft increased so also did the skill of their pilots, and the early hopes that the B-17s and B-24s could operate beyond the range of fighter escort began severely to be questioned. (6:15)

This doubt was compounded by a slowdown of logistics from the States. Planes, crews and supplies were not arriving at the rates anticipated in the CBO Plan,and the Eighth Air Force was ". . .suffering from a critical shortage of usable planes. (6:15; 2:34) A report to the Commander of Eighth Air Force noted that the CBO plan called for 944 heavy bombers by July 1943, 1192 by October 1943, 1746 by January 1944 and 2702 by April 1944. Eighth Air Force actually had 741 heavy bombers by July 1943 and

796 on 4 August 1943. (10:5) The Commander of Eighth Bomber Command wrote a memo to the Commander of Eighth Air Force, dated 27 September 1943, to emphasize that the actual number of bombers ". . .in this theater (counting the B-24s when in England, but not when in North Africa) averaged 665. The deficiency during this period therefore averaged 21.3 percent or 180 planes." (9:2) The memo went on to point out the problem of crew deficiencies:

> The deficiency of aircraft, however, was not as vital during this period as the deficiency in trained crews. . . .From experience in this theater it has been found that 70 trained crews are necessary for each 60 aircraft. The CBO Plan therefore would require an average of 986 crews to operate properly the required average of 845 B-17s and B-24s. Actually, there has been in the VIII Bomber Command an average of only 499 crews. The deficiency during this six month's period has therefore averaged 49.4 percent or 487 trained crews. (9:2)

This problem of shortages of planes and crews was compounded by the diversion of Eighth resources to other theaters of operation, pressure from Washington and combat losses.

The drain of strategic forces to meet the demands of theater commanders had impacted further upon the Eighth. (2:xi) "General Eisenhower drew off heavy bombers intended for the air offensive in Europe for use in direct support of land operations

in the Mediterranean." (4:257) The resulting shortage of planes and crews caused delays in operations. General H.H. "Hap" Arnold, Commanding General of the Army Air Force, was placing pressure on the Eighth for results. General Arnold sought to ". . .prove beyond doubt the capability of the B-17 and the workability of the American Air Force policy." (2:11) Cables from Arnold to Eaker complained ". . .that too few of the bombers. . .were being used in combat." (2:34) General Eaker responded

> . . .that a B-17's ability to return from a mission today did not necessarily mean it could safely carry a crew and a bomb load on another mission tomorrow. Some B-17s come back so thoroughly riddled it seemed miraculous that they could come back at all. (2:34)

The losses for the Eighth from 17 August 1942 to 31 July 1943 were 392 aircraft, 129 crew members killed, 631 wounded and 3531 missing. The average monthly loss rate for planes dispatched was 3.9 percent. (10:14) The short missions into Germany showed how vulnerable the unescorted bombers were to German fighters. But General Eaker knew that the bombing would have to continue--". . .the war would not wait until conditions were favorable for him." (2:234)

> He and Arnold and dozens of other American Air Force spokesmen had promised on countless occasions that if they had enough heavy bombers, they would be able to destroy great numbers of important German targets in

daylight attacks. Though Eaker did not yet have as many bombers as he had stipulated in the CBO plan, he had nevertheless a sizeable force. (2:235)

Meanwhile, Germany was continuing to produce its fighters, bombers, and other war materials.

"The German aircraft industry had expanded its capacity and was turning out so many fighter planes that it posed an almost prohibitive threat. . ." to the B-17s. (2:239) An increased threat from fighters would jeopardize the Schweinfurt mission and other deep penetrations against Germany. (2:239)

Intelligence reports indicated that two factories were then producing 48 percent of all German fighters--the Messerschmitt assembly plant at Regensburg and the Focke-Wulf plant at Wiener Neustadt in Austria,. . .both of these plants were far from England. Regensburg might be just barely within the range of the B-17, but Wiener Neustadt, at a distance of more than seven hundred miles, was far outside. The Austrian plant was not, however, outside the range of the heavy bombers, mostly B-24s, that had been taken from the Eighth Air Force and were now in Africa. . .(2:240)

The Eighth worked up a joint operation for B-17s from England to hit the Messerschmitt plant at Regensburg and the B-24s from Africa to attack the Focke-Wulf plant in Austria on 7 August 1943. Weather plagued the Eighth Air Force in England during July 1943 causing numerous mission diversions, recalls and

cancellations. (2:239) This weather carried over into August causing cancellation of the joint Regensburg-Austrian mission on 7 August 1943 and an Eighth Bomber Command mission to Schweinfurt on 10 August 1943. (2:24,258) On 13 August 1943, the B-24s in Africa conducted a successful mission against the Austrian Focke-Wulf plant. The Eighth Air Force planners, discouraged by the weather, worked up a new operation, ". . .a shuttle mission to Regensburg and then to Africa, which would draw off the German fighters while a larger force attacked Schweinfurt." (2:258)

This dual-pronged attack had a twofold purpose. The force bound for Regensburg, if successful, would further hamper Germany's fighter production capability. ". . .the Regensburg Messerschmitt plant was then turning out two-hundred of the deadly ME-109s each month, nearly 30 percent of Germany's single-engine fighter production." (2:3) The secondary mission of the Regensburg force was to serve as a decoy to ". . .lure most of the German fighters to the Regensburg area so that an even larger force. . .could slip through the German defenses. . . ." to strike the ball-bearing plants at Schweinfurt approximately 100 miles to the northwest. (2:3) (See Appendix, Map 1)

As laid out, 146 B-17s from the Fourth Bombardment Wing, led by Colonel Curtis E. LeMay, would take off from their bases in England and form up into a consolidated force over England before proceeding across the channel toward Germany and Regensburg. (2:3) Another force of 230 B-17s from the First Bombardment Wing

would take off nine minutes after LeMay's bombers to head for Schweinfurt. (2:3) (See Appendix, Map 2) With a forecast for good weather over Germany, 17 August 1943 was the day set for the dual strike. (2:24)

Despite the favorable weather over Germany, the mission was delayed on the morning of the 17th because of heavy fog in England. Brig. General Fred Anderson, Commander of Eighth Air Force Bomber Command was in his headquarters waiting for the English fog to lift so the mission could begin. (2:23) The fog was much thicker toward the inland on England, enabling the bomber groups of the Fourth Bombardment Wing, concentrated along the coast of England, to get airborne. General Anderson now had LeMay's force airborne and the Schweinfurt force, which was located further inland, grounded by fog. (2:4) At 9:35 A.M., Anderson sent LeMay on to Regensburg alone ". . .because he believed he had no choice." (2:24)

> If he had recalled them, they would have had a hard time finding their way down through the dense clouds to their bases. . . .If LeMay's groups were to go, they had to move while they still had enough fuel to reach their North African destinations, preferably before dark since they were unfamiliar with the bases at which they hoped to land. (2:24)

It was 10:30 A.M. before the inland fog began to lift. General Anderson now had to make the decision to send the Schweinfurt force. The weather over the European continent was the best

forecasted in over two weeks. But weather was not the only factor in the decision. (2:32) Anderson noted another consideraton:

> Inasmuch as the importance of these targets increased almost daily, the risk involved in dispatching the two bomb divisions individually was felt to be commensurate with the results which the destruction of these two targets would achieve. (2:32)

Despite the long delay, Anderson gave the word to go with the Schweinfurt mission. At Eighth Air Force Headquarters, General Eaker did not second guess the decision. Eaker ". . .understood Anderson's dilemma. . . ." But as the Commander of Eighth Air Force, ". . .there were also other considerations." (2:33)

> With the end of summer approaching, the weather in general wasn't likely to get any better, so there was no time for delay in fulfilling his most immediate responsibility: to prove the effectiveness of daylight precision bombardment by destroying some important and difficult German targets. (2:33)

At 11:20 A.M., the First Bombardment Wing began its departure from Schweinfurt. (2:32) It took another two hours for the four combat wings of 230 B-17s to form up and head across the English coast ". . .toward Antwerp, Eupen, Aachen, Wiesbaden, Darmstadt, and Schweinfurt." (2:33) At 11:45 A.M., as the Schweinfurt bombers were forming up over England, the B-17s of the Fourth Bombardment Wing were beginning their bombing run at Regensburg. (2:21)

While the bombers of the First Bombardment Wing were grounded by fog the B-17s in the Fourth were fighting a fierce battle with the fighters and gunners of the German Air Defense. The Germans had learned valuable lessons from their first encounters with the heavily defended B-17s. Rather than meeting the bombers with one mass attack, they used ". . .the newly-conceived strategy of deploying. . .in depth. . ."by distributing". . .fighters among a score or more of fields along the 150 mile wide corridor through which the bombers would have to fly. . .to their most likely German targets." (2:9) The fighter escort for the heavy bombers was short-ranged and had to leave when most needed by the B-17s. Cruising at 160 miles per hour the Regensburg B-17s were under attack for almost ninety minutes when they began their bomb run. (2:9)

> By the time LeMay's task force reached the Initial Point [IP] from which to begin the bombing run on the Messerschmitt fighter assembly plant in Regensburg, 15 of his Flying Fortresses had fallen to the German guns. But the surviving 131 still held ranks in their formation, the rearward planes moving forward to fill the gap each time one of their companions fell out. (2:20)

The formation of B-17s stretched for 15 miles across the German sky and for twenty-two minutes released ". . .303 tons of bombs on the Messerschmitt plant in one of the most accurate bombardments of the war to date." (2:20,21) As the task force

turned south toward Africa, the German fighters continued with their attacks. Crossing the Alps, the German fighters began to dwindle and the B-17s continued on ". . .unmolested for the first time since they had crossed the Belgian coastline." (2:21)

> They had flown through the thickest storm of bullets and shrapnel in the history of air warfare. . .For the Schweinfurt-bound men of the First Bombardment Wing, however, the ordeal had not yet begun. And the decoy strategy that had been designed to minimize that ordeal was now beyond hope of fulfillment. (2:21-22)

Once assembled, the 230 bombers for the Schweinfurt mission made up ". . .two large. . .task forces, each almost ten miles long." (2:40) The first task force of 116 B-17s was commanded by Colonel William M. Gross, and Colonel Howard M. "Slim" Turner was Air Commander of the 114 B-17s in the second task force. (2:32,40) Approaching the coast of Holland the bombers were met by a bank of clouds that forced a critical decision from Colonel Gross. He estimated the base of the clouds to be at 17,000 to 21,000 feet and the tops to be above 26,500 feet. (2:41) "The field order for the mission had specified that it be flown between 23,000 and 26,500 feet." (2:41) These altitudes were chosen to take advantage of the optimum altitude for the B-17 (23,000 feet) and to place the defending German ME-109s at their worst altitudes for performance--21,000 to 23,000 feet. (2:41) The optimum altitude for the ME-109 was 17,000 feet. Colonel

Gross's immediate concern was that if he elected to fly above 26,500 feet ". . .they would have to navigate on instruments and might not be able to see their target." (2:41)

> He decided, therefore, that despite the advantage it would give the German fighters, he would keep his task force under the clouds unless the ceiling descended further and drove him down into the flak fields below 17,000 feet. (2:41)

The descent to 17,000 feet began with an escort of ninety-six British Spitfires that would cover them to Antwerp and ". . .two American fighter groups scheduled to escort them as far as Aachen. . . ." (2:41) At 17,000 feet the German fighters did not hesitate to attack despite the escort of Spitfires. As the Spitfires reached the limit of their escort capability, the attacks by the Germans intensified. (2:41-45) The American P-47s caught up with the B-17s ". . .in the vicinity of Duren, ten miles east of Aachen, which was considered the outside limit of the P-47 range. . . ." (2:45) "At sight of the P-47s, the German pilots very sensibly pulled away, realizing these interlopers would be on the scene for no more than two or three minutes, after which the bombers would again be unprotected." (2:45-46) Attacks against the B-17s increased as the P-47s departed. Like the Regensburg force, the First Bombardment Wing now encountered the German fighters that had deployed in depth to defend key targets. (2:9)

As the Americans approached Schweinfurt, they had

already lost 21 bombers and the German fighters were still swarming around them like wasps, but the surviving Fortresses continued their relentless path toward the target. (2:53)

Approximately 420 tons of bombs were dropped on the Schweinfurt area. (2:58)

After an attack lasting twenty-four minutes, the bombers again faced the German air defenses on the return leg. (2:60) As the B-17s approached the German border, near the town of Eupen, friendly fighter escorts engaged the German attackers. (2:64) Nonetheless, the Luftwaffe fighters continued to harrass the B-17s until the formations approached the continental coast. (2:70) Coincidentally, the Flying Fortresses from the dual strike mission began simultaneous recoveries for landing at about 5:30 P.M.--the Schweinfurt bombers in England and the Regensburg bombers at Telergma in North Africa. (2:76) It was not until after all the aircraft from the two missions landed that the magnitude of the losses became known.

Total losses for the air battle proved to be staggering. A total of 60 aircraft were lost to German air defenses: 24 of the Regensburg bombers, 36 of the Schweinfurt bombers, and over 550 crewmembers ". . .killed or captured." (2:259) General Eaker was struck by a prohibitive loss rate of 16 percent of the bombers dispatched. (2:86) "In addition, early reports indicated that 27 of the Schweinfurt planes. . ." and ". . .at least twenty and possibly more. . ." of the Regensburg planes

were too badly damaged to fly again. (2:86,88) Approximately 140 other aircraft from the two missions would need repairs before flying again. (2:86,88) From a total force of 376 aircraft, approximately 110, or 29 percent, were destroyed in the air or too badly damaged to fly again. The cost in American bombers and crews had to be weighed against the damage inflicted on Germany.

Reconnaissance photos after the Regensburg-Schweinfurt mission reinforced the capability of precision daylight bombing. The Messerschmitt plant was almost totally destroyed by the concentration of bombs from LeMay's B-17s. (2:260) "All six main workshops were destroyed or badly damaged. . ." in addition to numerous other production, testing and support facilities in the factory complex. (2:260) The effect of the Schweinfurt bombs was more difficult to determine because of the area covered by the five ball-bearing factories. (2:260) But the photos did show ". . .eighty direct hits on the two largest factories. . ." (2:260) The damage appeared to be severe, but conclusive results could not be determined. (2:261) Despite the apparent success of the mission, the large numbers of bombers and crews lost brought Eighth Air Force bomber operations to a virtual standstill.

During the months of August and September 1943, General Eaker stopped deep bomber penetrations into Germany. The success of the German fighter defenses highlighted the need for long-range escort fighters. (2:263) General Eaker received

pressure from General Arnold to keep bombing Germany even without the cover of long-range fighters. (2:265) Sporadic raids were made into France,but weather prevented raids into Germany during the month of September 1943. Regardless of the weather, Eaker was reluctant to send his decimated forces into Germany until more planes and crews were available. Intelligence reports of a German effort to build up their fighter defenses against the B-17s concerned him. (2:265)

> [Eaker] was told that. . .755 single-engine fighters plus 680 twin-engine fighters [were] in the western defense corridors. These 1,435 planes. . .were 65 percent of the total German fighter strength. [These] figures. . .suggested that the Germans were preparing to hurt the Fortresses, perhaps prohibitively unless the Americans stormed the defenses in sufficiently large numbers. (2:265)

The Eighth received more B-17s and crews from the States along with increased pressure from Arnold for more sorties into Germany. Coupled with this, intelligence reports about Germany's efforts to compensate for reduced ball-bearing production at Schweinfurt put Eaker in an untenable position. (2:265,267-268)

Reconnaissance photos showed that the Germans were now placing the majority of their fighter defense in corridors that led to Schweinfurt. (2:267) This gave Eaker the insight he needed into the importance of Schweinfurt's ball bearings to German industry. Allied intelligence reported on the efforts of

Germany to acquire ball bearings from throughout Europe, including the entire output of Sweden, ". . .one of Europe's top producers." (2:267) The effect of the August 17 raid against Schweinfurt was apparent.

> After only one attack against Schweinfurt the enemy was scrounging for ball bearings just as England had been forced to do so after one German attack against Chelmsford. Here was proof enough that another raid would be worth the cost. . . .The Eighth Air Force would have to return to the Schweinfurt. . .before all the August damage could be repaired. (2:267-268)

Raids into Germany could not wait for the long-range escort fighters needed to protect the B-17s from the Luftwaffe. (2:268)

Early in 1943 the Germans ". . .made their first major moves to stem the attacks. . ." by the Americans. (1:58) The Germans believed they had the strength and means to break the back of the coming American heavy bomber offensive." (1:58) Infrequent attack by the Eighth Bomber Command in the first half of 1943 enabled the German defense system to ". . .perfect their daylight defensive system, to eliminate weaknesses, and to exploit their strength to the utmost." (2:59) Rather than trying to repulse the American bombers at the English Channel, defensive fighters were "deployed in depth" along the routes the bombers would most likely fly to reach targets in Germany. (2:9)

"The fighters stationed at each field took off only as the bombers approached; and as each group emptied its guns and

exhausted its fuel against the passing invaders, a fresh group would arrive to replace it." (2:9) The spent fighters could then recover to be refueled and rearmed while the pilot sat in the cockpit. This "quick turn" capability enabled the Luftwaffe to rapidly prepare to strike the bombers returning to England. (1:59) Additionally, the Germans increased the size of their antiaircraft flak batteries from 4 to 8 heavy guns, and critical areas were defended by larger groupings numbering as many as 40 heavy guns firing under a single control. (1:58) This concentrated firepower, if provided with accurate altitude and lead information, proved very effective against the B-17s. (1:58) The German fighter forces also had to adjust their tactics against the Flying Fortresses.

With as many as ten 50 caliber machine guns on a B-17, a formation of 20 Fortresses presented a ". . .tremendous defensive array of no less than 200 heavy caliber machine guns." (1:56-57) The standard German fighter tactic of attacking from the rear provided disadvantages of slow overtake and long exposure to the formidable firepower of the American defensive bomber formations. (1:56-57) Adjusting to make frontal attacks against the formations, the Luftwaffe gained an advantage by drastically increasing rate of closure and minimizing exposure time to the guns of the B-17s. (1:57) In addition to the 20 and 30 millimeter cannons on their fighters, the Germans used other means to knock the bombers from the air. Rockets were developed for the fighters to fire into the bomber formations. (1:59-60)

Furthermore, aerial bombs, mines hanging from parachutes, and long cables were dropped into the formations in attempts to stop the bombers. (1:60) This extraordinary effort to defend the German industrial heartland also required the movement of fighters from the Eastern and Mediterranean Fronts to the Western Front. (1:62) As Eaker's intelligence agency had reported, 1,435 single and twin-engined fighters waited for the B-17s to return for a second attack on Schweinfurt. (2:265)

Planning for the second Schweinfurt raid was completed on 12 October 1943. A concentrated force of all of the available bombers in the Eighth Bomber Command ". . .would go to Schweinfurt in the Eighth Air Force's greatest show of strength." (2:281) With over 400 bombers and crews to participate in this one raid, General Eaker gave his approval for the mission. (2:281) On the morning of 14 October 1943, the American crews again prepared to attack the ball-bearing works at Schweinfurt.

At 7:00 A.M. on 14 October, at bases throughout England, the crews for the second Schweinfurt raid gathered for their mission briefings. (2:282) The plan called for an armada of three air divisions to fly into Germany to attack the ball-bearing works again. The First Air Division (previously the First Bombardment Wing), the Second Air Division (previously the Second Bombardment Wing), and the Third Air Division (formerly the Fourth Bombardment Wing), were combined to make up a force of 383 heavy bombers. A total of 323 B-17s made up the First and Fourth Air Division, and 60 B-24s were assigned to the Second Air Division.

(1:131-135) The First Air Division, led by Colonel Budd Peaslee, would precede the Third Air Division into Germany. (1:131-135) As a diversion to the German defenses, the B-24s of the Second Air Division would ". . .fly a longer route into Germany, to the south of the B-17s. . .and accomplish a specific time rendezvous just before the IP. . ." (1:135) Takeoffs began at approximately 10:00 A.M. Unexpected weather over England hampered rendezvous, and mechanical failures further reduced the size of the invading force. Once formed up, the 1st and 3rd Air Divisions were made up of only 291 B-17s and the 2nd Air Division had only 21 B-24s. (1:307,310) Eighth Bomber Command elected to send the 21 B-24s to the north on a diversion route up the North Sea rather than sending them to Schweinfurt. (2:288) (See Appendix, Map 3) At approximately 12:20 P.M., as the lead bombers crossed the English coast enroute to Schweinfurt, the German Central Defense Headquarter's monitoring system knew the size and direction of the American bomber force. (2:291) "By 12:50, when the First Division crossed the Dutch coast, German planes. . .were in the air to meet them." (2:292)

Again, on this second mission to Schweinfurt, the B-17s would face the continuous attacks of the Luftwaffe fighters. A flight of ME-109s initially attempted, but failed, to draw off the escorting P-47s as the American armada approached the Dutch coast. (2:292) The majority of the enemy fighters waited for the Thunderbolts to turn back near Aachen. (2:294) Once the P-47s left, the attacks on the B-17s began.

> The sky around the bombers filled up with ME-109s, FW-190s, ME-110s, ME-210s, JU-88s and even Stuka dive bombers. . . .[The] twin-engine ME-110s and ME-210s lobbed rockets into the formation. . . .[while] the Stukas climbed safely above the fortresses and dropped time-fused bombs among them. The ME-109s and FW-190s sped in from front and rear, firing 20-mm cannons, rockets and machine guns. (2:294)

"The entire First Division was now under constant siege by about two hundred German planes." (2:298) In contrast, fewer than one hundred enemy fighters initially attacked the Third Air Division. (2:300) These attacks continued for the entire route into Schweinfurt. As the lead bombers reached Schweinfurt at 2:39 P.M., flak from the reported three hundred 88-mm anti-aircraft guns was in the air. (2:287,306) The bombers droned on, dropping ". . .over 500 tons of bombs on the ball-bearing plants. . . ." before turning to return to England and the waiting German fighters. (2:325)

Once the bombers had recovered in England, the results of the mission came out. The losses were again staggering--of the 291 bombers dispatched, 60 were shot down and 145 were damaged. (2:232) The loss rate was 19 percent, and once again it was difficult to determine accurately the effects of the bombs on the ball-bearing works. Strike photos of the target could not be relied upon because of the smoke and debris generated by the bombs. (2:331) General Eaker again had difficulty determining

if the heavy loss of bombers and over 600 crewmembers was justified by the damage inflicted upon the Germans.

Damage on the 14 October raid was, in fact, more severe than on the 17 August Schweinfurt raid. Improved bombing techniques by American bombardiers and an increased ratio of incendiary bombs intensified the fire damage to the ball-bearing factories. (2:325) Fires from the incendiary bombs destroyed the precision machinery used to make ball bearings while damage to a machine caused by a high explosive bomb could be repaired. (2:338) The aides to Adolph Speer, Hitler's Minister of Armaments and War Production, determined ". . .that the 14 October attack had destroyed 60 percent of Schweinfurt's total production capacity. . . ." (2:338) These facts Eaker could not know, but he did know that his bombers would need long-range escort fighters if missions into Germany were to continue. (2:340)

The loss of 60 bombers added to the other 88 losses during the first two weeks of October ". . .were a prohibitive depletion. . ." of Eaker's forces. (2:340) Arnold provided sufficient replacements by the end of October for the Eighth Bomber Command to send out forces of as many as 500 aircraft. (2:340) Despite possessing the capacity to send destruction to the heart of Germany, the need to escort the heavy bombers to and from their targets with ". . .long-range fighters was now fully acknowledged." (2:340) Eighth Air Force missions into Germany virtually ceased until the P-51 Mustang began operational sorties with the heavy bombers in December, 1943. (2:344)

Chapter Two

THE PRINCIPLES OF WAR

This chapter will list and define the "Principles of War" from AFM 1-1, Basic Aerospace Doctrine of the United States Air Force, that are applicable for the Schweinfurt raids on 17 August and 14 October 1943. Following each principle, examples of positive and/or negative applications during the Schweinfurt bombing missions will be discussed.

> There is no simple formula for the military professional to learn warfighting. Gaining that knowledge is a continuous process that is the product of institutionalized education and training, experience, and personal effort. . . .
>
> . . .All of the principles of war are interrelated and interacting elements of warfare. They are not separate and distinct entities from which a commander selectively chooses and applies to employing forces. Put in perspective, the principles of war help provide a better understanding of warfare, but they are not a series of checklist items that necessarily lead to a victory. The principles of war are an important element of the art and science of warfare, but the

understanding and mastery of this art requires a depth of knowledge far beyond mere principles. (12:2-4)

These quotes from AFM 1-1 serve as an introduction to the principles of war. More important, this look at the principles and the conduct of the Schweinfurt raids provides an opportunity to gain from the experience of history. Each sample should stimulate thought and discussion, but it is most important to remember that these are not "the final solution."

OBJECTIVE

The most basic principle for success in any military operation is a clear and concise statement of a realistic objective. The objective defines what the military action intends to accomplish and normally describes the nature and scope of an operation. An objective may vary from the overall objective of a broad military operation to the detailed objective of a specific attack. The ultimate military objective of war is to neutralize or destroy the enemy's armed forces and his will to fight. However, the intimate bond which ties war to politics cannot be ignored. War is a means to achieving a political objective and must never be considered apart from the political end. Consequently, political imperatives shape and define military objectives. It follows that the objective of

each military operation must contribute to the overall political objective. (12:2-4)

Americans

The military objectives for the Schweinfurt missions were clearly defined. Opportunity to gain political support in the U.S. for daylight precision bombing was a "supplemental" objective. General H.H. "Hap" Arnold, Commander of Army Air Forces, determined that examples of the destructive capability of strategic bombing were needed to get more bombers produced. (2:234-235) General Ira Eaker, Commander of Eighth Air Force, saw Schweinfurt as an ideal target for the military objective as well as the political objective. (2:11,235).

The Casablanca Conference of January 1943 determined the Allied strategy for the war. A Combined Bomber Offensive (CBO) Plan was developed for the U.S. Army Air Forces and the Royal Air Force to prepare the way for the land invasion of Western Europe. (6:14) Five target systems, or principal objectives, identified for the combined bomber offensive were: ball bearings, petroleum production, synthetic rubber plants, rubber tire plants, and military transport plants. (11:17) However, the overriding objective of the plan was the destruction of the German Luftwaffe, ". . .particularly its fighter strength." (6:15) Destruction of the German Luftwaffe provides ". . .freedom for bombardment operations. . ." and ". . .the necessary air superiority. . .to permit major land operations on the

continent." (11:7) The CBO Plan noted that "If the growth of the German fighter strength is not arrested quickly, it may become literally impossible to carry out the destruction planned." (6:15) Allied planners determined that ball bearings were critical to Germany's wartime industrial base and fighter aircraft production in particular. (1:44) In June 1943, Schweinfurt's five ball-bearing plants produced 52 percent of Germany's ball bearings. (2:237) The destruction of these factories could strike a serious blow to Germany's production capability ". . .without diverting any major effort from the current task of assuring air superiority." (11:18) Destruction of Schweinfurt's ball-bearing production capability was a clearly defined objective for Eighth Air Force.

The political objective behind the missions to Schweinfurt was not so clearly defined. General Ira Eaker had received pressure from General Arnold to ". . .prove beyond doubt the capability of the B-17 and the workability of the American Air Force policy. . ." of daylight precision bombing. (2:11) Arnold needed examples of daylight precision bombing's capability to destroy critical German targets to gain support at home for increased production of bombers. (2:234-235) Eaker was concerned about his shortage of aircraft, aircrews, combat losses, and the threat German fighters presented to unescorted bombers. (2:xi,34,234) However, Eaker knew that ". . .the war would not wait until conditions were favorable for him." (2:235) Schweinfurt provided an ideal target to show the ability of

daylight precision bombing to destroy the enemy's critical targets and to answer Arnold's calls to get more bombers into combat. (2:11,235)

Germans

While the Luftwaffe believed it had the ability to stop the heavy bomber offensive of the Americans, Germany recognized the threat presented by daylight precision bombing. (1:58) Initial sporadic attacks by the Americans gave the Germans time to develop their daylight defense system. During the first half of 1943 the Germans used the breaks between attacks to evaluate the performance of their system and strengthen their weaknesses. (2:59) General Adolph Galland, the Luftwaffe's General in Command of Fighters, noted that the "peripheral defense" used by the Luftwaffe proved inadequate for large bomber forces. To strengthen the fighter force he relocated his fighters from the coast to bases throughout France, Holland, Belgium and Germany. This deployment in depth supported the Luftwaffe's objective of stopping the American bombers. (3:198,199) The redistribution of fighter resources proved very effective at inflicting high losses on the Americans. However, the Luftwaffe proved unable to completely stop the bombers.

OFFENSIVE

Unless offensive action is initiated, military victory is seldom possible. The principle of offensive is to

act rather than react. The offensive enables commanders to select priorities of attack, as well as the time, place, and weaponry necessary to achieve objectives. Aerospace forces possess a capability to seize the offensive and can be employed rapidly and directly against enemy targets. Aerospace forces have the power to penetrate to the heart of an enemy's strength without first defeating defending forces in detail. Therefore, to take full advantage of the capabilities of aerospace power, it is imperative that air commanders seize the offensive at the very outset of hostilities. (12:2-5)

Americans

The Eighth Bomber Command took the fight to the heart of Germany with the Schweinfurt raids. Though losses were anticipated, the large numbers of heavy bombers flying in their defensive box formations presented a formidable force. (8:155) German defenses could not stop the large formations of bombers from bombing Schweinfurt's ball-bearing plants. But the loss rate of more than 20 percent was prohibitive, and the Americans lost the offensive. (2:86,232) After the 17 August 1943 raid, deep penetrations into Germany virtually ceased while the Eighth Air Force rebuilt its strength of bombers and crews. (2:263-265) The need for long-range fighters to escort the heavy bombers was highlighted by the first Schweinfurt losses; however, the need to

strike at Germany was rated more important, and the B-17s again flew to Schweinfurt. The losses on 14 October 1943 again took the offensive from the Americans and the Eighth Bomber Command did not venture back to Germany until the arrival of the P-51 long-range fighter in December 1943. (2:232,344)

Germans

Some say the best defense is a good offense. After recognizing the threat presented by the large formations of B-17s, the reorganization of the Luftwaffe's defense system proved very effective in curtailing daylight precision bombing. (2:263-265) Though the total bomber forces could not be stopped, the Luftwaffe fighters inflicted such high losses on the Americans that the Eighth Bomber Command was forced to hold back. The strong defense took the advantage from the Americans and on 14 October 1943, stopped deep penetrations into Germany for almost two months.

SURPRISE

Surprise is the attack of an enemy at a time, place, and manner for which the enemy is neither prepared nor expecting an attack. The principle of surprise is achieved when an enemy is unable to react effectively to an attack. Surprise is achieved through security, deception, audacity, originality, and timely execution. Surprise can decisively shift the balance of power.

> Surprise gives attacking forces the advantage of seizing the initiative while forcing the enemy to react. When other factors influencing the conduct of war are unfavorable, surprise may be the key element in achieving the objective. The execution of surprise attacks can often reverse the military situation, generate opportunities for air and surface forces to seize the offensive, and disrupt the cohesion and fighting effectiveness of enemy forces. Surprise is a most powerful influence in aerospace operations, and commanders must make every effort to attain it. Surprise requires a commander to have adequate command, control, and communications to direct his forces, accurate intelligence information to exploit enemy weaknesses, effective deception to divert enemy attention, and sufficient security to deny an enemy sufficient warning and reaction to a surprise attack. (12:2-5)

Americans

Germany was not prepared for the 17 August 1943 attack on the Schweinfurt ball-bearing plants. In late 1942, Albert Speer, Minister of Armanents and War Production for Germany, was concerned about the importance of Schweinfurt's ball-bearing plants to the war effort. (7:280) By 19 December 1942, Speer realized that ball bearings had become crucial to Germany's

armaments production and directed decentralization of armaments manufacturers to reduce their vulnerability to bombardment. His directive met political resistance and nothing was done. (7:284,287) The 17 August raid was ". . .a shock to the German High Command." (3:193) The impact of the 17 August attack (ball-bearing production fell 38 percent) precluded further attempts to disperse that industry. (7:285) Speer noted: "Despite the peril to Schweinfurt we had to patch up our facilities there, for to attempt to relocate our ball-bearing industry would have held up production entirely for three or four months." (7:285) However, despite the results of that raid, the Americans could not follow up because they lost the offensive due to unexpected losses and the element of surprise lost its effect.

Germans

The defense presented by the Luftwaffe on 17 August 1943 surprised the American bomber force. By deploying its fighters in depth the Luftwaffe could provide continuous opposition to the invading bombers. (2:9) Developing new tactics and weapons also allowed the Germans to exploit the weaknesses in the defensive formations of the heavy bombers. (1:57,59-60) American loss rates were five times those expected, and the use of large bomber formations to strike the industrial targets of Germany proved not to be as economical as expected. (8:155) The unexpected losses caused the Americans to reevaluate the use of unescorted bombers.

SECURITY

Security protects friendly military operations from enemy activities which could hamper or defeat aerospace forces. Security is taking continuous, positive measures to prevent surprise and preserve freedom of action. Security involves active and passive defensive measures and the denial of useful information to an enemy. To deny an enemy knowledge of friendly capabilities and actions requires a concerted effort in both peace and war. Security protects friendly forces from an effective enemy attack through defensive operations and by masking the location, strength, and intentions of friendly forces. In conducting these actions, air commanders at all levels are ultimately responsible for the security of their forces. Security in aerospace operations is achieved through a combination of factors such as secrecy, disguise, operational security, deception, dispersal, maneuver, timing, posturing, and the defense and hardening of forces. Security is enhanced by establishing an effective command, control, communications, and intelligence network. Intelligence efforts minimize the potential for enemy actions to achieve surprise or maintain an initiative, and effective command, control, and communications permit friendly forces to exploit

enemy weaknesses and respond to enemy actions. (12:2-5)

Americans

Massive formations of heavy bombers proved to be vulnerable to the defense presented by the Luftwaffe. Losses far exceeded those anticipated,and the Eighth was forced to cease its operations into Germany for a period of time. (2:261-263,344) The losses pointed out the requirement for long-range escort fighters to protect the bombers and increased the efforts of American leaders to get the escort fighters needed. (2:263)

Germans

The Germans used their defense systems effectively against the American heavy bomber formations. The use of radar and monitoring stations enabled the Germans to determine the size and direction of the bomber forces. Though they could not determine the bombers' destination, by repositioning their fighters and antiaircraft artillery, the Luftwaffe could more effectively employ defense resources against the bombers. (2:292) By adjusting the fighter tactics to capitalize on the weaknesses of the bomber formations, the Luftwaffe inflicted the great losses sustained by the Eighth on these raids. (1:56-57) Granted, the Luftwaffe proved unable to stop the B-17s from bombing Schweinfurt, but the heavy losses sustained by the Americans proved effective in stopping operations into Germany for almost two months after each of the Schweinfurt raids. (2:261-263,344)

MASS AND ECONOMY OF FORCE

Success in achieving objectives with aerospace power requires a proper balance between the principles of mass and economy of force. Concentrated firepower can overwhelm enemy defenses and secure an objective at the right time and place. Because of their characteristics and capabilities, aerospace forces possess the ability to concentrate enormous decisive striking power upon selected targets when and where it is needed most. The impact of these attacks can break the enemy's defenses, disrupt his plan of attack, destroy the cohesion of his forces, produce the psychological shock that may thwart a critical enemy thrust, or create an opportunity for friendly forces to seize the offensive. Concurrently, using economy of force permits a commander to execute attacks with appropriate mass at the critical time and place without wasting resources on secondary objectives. War will always involve the determination of priorities. The difficulty in determining these priorities is directly proportional to the capabilities and actions of the enemy and the combat environment. Commanders at all levels must determine and continually refine priorities among competing demands for limited aerospace assets. This requires a balance between mass

and economy of force, but the paramount considerations for commanders must always be the objective. Expending excessive efforts on secondary objectives would tend to dissipate the strength of aerospace forces and possibly render them incapable of achieving the primary objective. Economy of force helps to preserve the strength of aerospace forces and retain the capability to employ decisive firepower when and where it is needed most. (12:2-6)

Americans

U.S. Army Air Force leaders firmly believed in the ability of large formations of heavy bombers to destroy critical enemy targets. Aircraft of the caliber of the B-17 and B-24 flown in large formations provided enormous defensive capability against enemy fighters while delivering large quantities of bombs for target destruction. (8:155) On 17 August 1943, the Eighth Air Force decided to divide its forces to attack targets deep in Germany. One force, consisting of 146 bombers, would fly to Regensburg to attack a Messerschmitt fighter assembly plant. The Regensburg force served as a diversion for German defenses, and as a demonstration of shuttle bombing with recoveries in North Africa. Another force of 230 heavy bombers would strike the ball-bearing factories at Schweinfurt. (2:3,258) Weather delayed the departure of the Schweinfurt bombers and the Regensburg force was sent on alone with the Schweinfurt bombers

following two hours later. (2:24,32) The planned deception to confuse the enemy defense never materialized. The delay allowed the Luftwaffe's fighters to attack the Regensburg force, land, and prepare for the Schweinfurt bombers. (2:9) Consequently, the Eighth Bomber Command suffered unexpected losses. (2:86,88)

Albert Speer was surprised at this dual-pronged attack. He believed the Americans should have concentrated the force of 376 bombers to attack the Schweinfurt ball-bearing facilities. Speer's memoirs noted that the attack at Regensburg was of only ". . .minor consequence." (7:285)

During the 14 October 1943 mission to Schweinfurt, the Eighth massed its forces for one large attack on the ball-bearing factories. German defenders again caused large losses, and the original idea that unescorted bombers could succeed with acceptable losses was again shaken. (2:232,340) Following both of these raids, the Eighth Air Force ceased its deep penetration missions into Germany to allow time to rebuild the force. (2:265,340) In addition, the 14 October 1943 mission was the last until long-range fighter escort arrived in December 1943. (2:340) General Haywood Hansell noted: "In retrospect, it is clear that the raids should not have been undertaken until they could be prosecuted and sustained with sufficient force and within acceptable losses." (4:215) Furthermore, Hansell said the raids should have been delayed until later in the war when more bombers were available ". . .to carry out the initial

destruction. . ." and long-range fighters were available ". . .to minimize the losses. . . ." (4:215-216)

It is apparent the Americans placed too much emphasis on the ability of large formations of heavily armed bombers to destroy enemy targets. Furthermore, they realized too late the importance of long-range escort fighters to protect the bombers. (2:340)

Germans

By deploying their fighters along the corridors to primary military targets, the Germans were able to inflict heavy losses on American bomber forces. (2:88,232) This in-depth deployment provided the most effective and efficient use of its fighters. The Luftwaffe could land, refuel and rearm, and be prepared to use its fighters again as directed by radar and ground controllers to get back into the fight. (2:9; 1:59)

However, having to mass its fighters on the Western Front weakened the Luftwaffe on the Russian and Mediterranean Fronts. This German redeployment would eventually help the Allies in their effort to destroy the Luftwaffe. (6:15; 2:265)

TIMING AND TEMPO

Timing and tempo is the principle of executing military operations at a point in time and at a rate which optimizes the use of friendly forces and which inhibits or denies the effectiveness of enemy forces. The

purpose is to dominate the action, to remain unpredictable, and to create uncertainty in the mind of the enemy. Commanders seek to influence the timing and tempo of military actions by seizing the initiative and operating beyond the enemy's ability to react effectively. Controlling the action may require a mix of surprise, security, mass and maneuver to take advantage of emerging and fleeting opportunities. Consequently, attacks against an enemy must be executed at a time, frequency, and intensity that will do the most to achieve objectives. Timing and tempo require that commanders have an intelligence structure that can identify opportunities and a command, control and communications network that can responsively direct combat power to take advantage of those oppportunities. (12:2-6)

Americans

Too great a reliance on the capabilities of mass bomber formations hurt the American missions to Schweinfurt. Eighth Air Force may have been wise to delay these deep penetration missions until later in the war when more resources were available. (4:215) Additionally, larger bomber formations could have intensified the damage to the ball-bearing factories and machinery at Schweinfurt. Lastly, delaying the raids would have

allowed long-range fighter escort to tie up enemy fighters and reduced the losses of the heavy bombers. (2:340; 4:215-216)

Because of the losses suffered, the Eighth could not follow up their attacks on Schweinfurt, nor could they capitalize on the initial surprise obtained on the first attack on 17 August 1943. Albert Speer wondered when the Americans would realize what the effect of destroying a few small targets could have on German armament production. Once Schweinfurt was struck on 17 August, he was surprised that the next raid did not occur until 14 October 1943. (7:285)

Germans

The time needed to assemble a large formation of heavy Allied bombers over England gave Germany's radar and monitoring facilities time to alert their forces. (2:33,287-288,292) Once the bomber formation was at the English coast and ready to cross the Channel, the German defenses knew the size and direction of the bombers. Though they did not know the target, they were able to prepare their fighters and have them in location to intercept the American bombers. (2:292)

Once the Luftwaffe adopted its deployed posture, the bombers experienced continuous harrassment from the German fighters. Germany optimized the use of its defense system to impose the greatest possible losses on the American forces. (2:9; 1:59)

LOGISTICS

Logistics is the principle of sustaining both man and machine in combat. Logistics is the principle of obtaining, moving, and maintaining warfighting potential. Success in warfare depends on getting sufficient men and machines in the right position at the right time. This requires a simple, secure, and flexible logistics system to be an integral part of an air operation. Regardless of the scope and nature of a military operation, logistics is one principle that must always be given attention. Logistics can limit the extent of an operation or permit the attainment of objectives. In sustained air warfare, logistics may require the constant attention of an air commander. This can impose a competing and draining demand on the time and energy of a commander, particularly when that commander may be immersed in making critical operational decisions. This competing demand will also impose a heavy burden on a command, control and communications network. The information, mechanics, and decisions required to get men, machines, and their required material where and when they are needed is extensive and demanding. During intense combat, these logistics decisions may even tend to saturate the time and attention of a commander. To reduce the stresses

imposed by potentially critical logistics decisions, commanders must establish a simple and secure logistics system in peacetime that can reduce the burden of constant attention in wartime. (12:2-7)

Americans

Unexpected losses during the Schweinfurt raids caused serious depletions of crews and airplanes. After each of the Schweinfurt missions the Eighth Bomber Command was forced to stop its operation into Germany until the bomber strength could be improved. (2:265,340) But replacements from the States were slow; much slower than planned for at Casablanca. (10:5; 9:2) General Arnold's efforts to get more bombers were countered by the U.S. Navy's efforts to get more carrier planes for Pacific operations. (2:34) Additionally, the Schweinfurt losses highlighted the need for long-range fighter escort to protect the bombers. (2:234,263) General Eaker had been frustrated in his efforts to get external drop tanks to extend the range of his P-47s. (2:207-208) The American Air Force Test Facility's lack of confidence in the capabilities of the P-51 delayed its production for approximately six months. (2:179) Each of these factors individually and collectively had an impact on the outcome of Schweinfurt missions and Eighth Air Force's operational capability.

Germans

In 1943, the Germans found themselves lagging in the production of fighters. Hitler sacrificed fighter production for

bombers to resume air attacks on England. (3:176-177) This sacrifice caused a decline in quantities of fighters and in the quality of performance--ME-109s and FW-190s remained the workhorses of the Luftwaffe. (3:168-169) Adolf Galland noted that the tense state of the war did not allow the momentary stoppage needed to shift production to newer weapons. To stop production to achieve ". . .only a limited technical advance on a par with the Anglo-American standard would win nothing because of the unavoidable temporary loss of production." (3:168) The Germans needed a great technical jump to use superior performance to beat the numerical advantage of the Allies. (3:168) The Messerschmitt ME-262 jet fighter provided that superior performance. In May 1943, the ME-262 was ready to begin production. (3:272) However, Hitler did not approve production of the ME-262 until the end of 1943. (3:277) The overall lack of emphasis on German fighter production resulted in the need to draw resources from the Mediterranean and the Eastern Fronts to strengthen the Luftwaffe's defense on the west. (1:8)

Chapter Three

DISCUSSION QUESTIONS

This chapter contains questions for use in a guided discussion. The purpose is to enhance an individual's understanding of a significant event in the history of airpower. Additionally, a guided discussion will provide some insight into the problems associated with blindly following or completely ignoring the principles of war.

Discussion of the principles of war should not be limited to the American activities. Follow through and discuss the principles as they apply to German efforts to stop the raids on Schweinfurt. The questions presented should serve to get the discussion going but are not intended to be rigidly adhered to. Be flexible--that's the key to airpower.

QUESTION

Were ball bearings a valid target option at the time the Schweinfurt raids were accomplished?

DISCUSSION

Strikes against ball-bearing production met the objective of the Casablanca Conference and the Combined Bomber Offensive. The Eighth Air Force had determined the concentration and

vulnerability of the Schweinfurt ball-bearing factories made them ideal targets for daylight precision bombing. However, deep penetration of unescorted bombers into Germany resulted in very high losses. Consequently, Eighth Air Force did not keep up a sustained attack against the ball-bearing industry, and the desired effect of halting ball-bearing production was not achieved. In his book, The Air Plan That Defeated Hitler, General Haywood Hansell noted the raids should have been delayed until the Eighth had sufficient bombers and a fighter escort to make repeated attacks on the ball-bearing industry with a more acceptable loss rate.

QUESTION

Did the Schweinfurt raids support the American confidence in daylight precision bombing?

DISCUSSION

The raids did show that precision bombing against key industries could have an impact on the production capabilities of the Germans. Albert Speer in Inside the Third Reich noted that the first raid reduced Schweinfurt's ball-bearing production by 38 percent and that the second raid reduced production by 67 percent. The Germans did have to seek outside sources for ball bearings as well as alternative production techniques. Not following up on the raids made daylight precision bombing appear to be too costly in losses of crews and aircraft to be effective.

QUESTION

Was night area bombing as advocated by the British more applicable to the Schweinfurt raids?

DISCUSSION

No. The Royal Air Force turned down the initial requests by planners to hit Schweinfurt. Difficulties in finding a target that deep into Germany was a primary reason for rejecting the idea. An additional consideration would be the number of sorties or missions needed to assure destruction of a target that cannot be precisely located.

QUESTION

How did logistics impact on Eighth Air Force operations and the Schweinfurt raids?

DISCUSSION

Chapter One noted that bombers and crews were not arriving as planned. Shortages of resources and demands on those resources by other theaters of operations degraded Eighth Air Force's ability to conduct sustained bombing missions against Germany. Additionally, not getting the external drop tanks needed to increase the operational range of escort fighters took away the protection needed by the bombers. Not having the capability to mount sustained operations against Germany while minimizing B-17 losses to Luftwaffe fighters degraded the Eighth's effectiveness against ball-bearing production.

QUESTION

Were the German defenses effective against the large bomber formations?

DISCUSSION

Considering the logistic problems the Eighth was experiencing at that time--yes. Adjusting the location of the fighter airfields and anti-aircraft artillery to provide greater coverage by the defensive forces was effective. Additionally, devising new tactics and weapons to be used by the Luftwaffe pilots against the bomber formations contributed to high losses suffered by the Americans. However, the Germans were unable to stop bombs from falling on the targets. Even though the Americans had periods of no operations into Germany, damage had been inflicted on an industry critical to Germany's wartime production.

QUESTION

What would have been the contribution of a long-range fighter escort to the outcome of the Schweinfurt raids?

DISCUSSION

An earlier introduction of long-range fighters, particularly the P-51 Mustang, into the European Theater could have had a significant impact on the Schweinfurt missions. Assumptions must be made that escort fighters could tie up Luftwaffe fighters sufficiently to cut the bomber loss rate to a more acceptable

level. Lower loss rates would have allowed continuous bombing operations deep into Germany, not only against Schweinfurt but to other locations of industries important to Germany's wartime production.

QUESTION

The principles of war can be applied to the Schweinfurt raids. Which of the principles of war were followed by the Americans and why?

DISCUSSION

The principles of objective, offensive, and surprise were followed by the Americans in the conduct of the raids on Schweinfurt's ball-bearing facilities. The objectives to be achieved through Allied operations were clarified at the Casablanca Conference in early 1943. Operations conducted by Eighth Air Force bombers against Schweinfurt met these objectives.

In meeting its stated objectives, the Eighth was also on the offensive against Germany by massing B-17s to take the fight to the heart of Germany. Furthermore, the attacks against Schweinfurt surprised the Germans. Albert Speer noted in his memoirs, Inside the Third Reich, that his desires to disperse the ball-bearing facilities at Schweinfurt went unheeded.

QUESTION

Which of the principles of war were violated by the Americans and why?

DISCUSSION

The principles of security, mass and economy of force, timing and tempo, and logistics were violated. Security, or defense of the bomber formations, proved inadequate against the German defense system. The principles of mass and economy of force were violated in that the size of the formations was not sufficient to insure destruction of the target while minimizing losses. The division of forces on 17 August 1943 to attack Regensburg took resources that would have been better used on the Schweinfurt raid. On both the 17 August and 14 October 1943 missions the Eighth proved unable to dominate the situation--timing and tempo were lost. After each of these missions the Eighth was forced to stop operations to rebuild its forces when follow-up bombings would have been more appropriate for the objective. Logistics prevented any follow up activity. New bombers and replacement crews were not arriving as fast as was anticipated and operations suffered. Additionally, not having fighter escort contributed to the high losses of American bombers and crews.

QUESTION

Which principles of war were followed by the Germans in their defense against the Schweinfurt raids? Why?

DISCUSSION

The principles of objective, surprise, security, and timing and tempo were all followed by the Germans. The Luftwaffe

recognized the threat presented by the American heavy bombers and reorganized its defense systems to defeat that threat. Virtually continuous attacks from the Luftwaffe fighters surprised the Americans. By using its radar and monitoring stations, the Germans were able to direct their defending fighters for continuous attacks against the invaders and inflicted heavy losses on the bomber forces.

QUESTION

Which principles of war were violated by the Germans and why?

DISCUSSION

The principles of mass, economy of force, and logistics were violated by the Germans. Having to mass fighters on the Western Front to defend against Allied bombing degraded the Luftwaffe's capabilities on the Eastern Front and in the Mediterranean. Furthermore, as noted by Adolf Galland in his book The First and the Last, the production of German fighters had lagged the Allies in both quantities and quality. Hitler sacrificed fighters for bombers.

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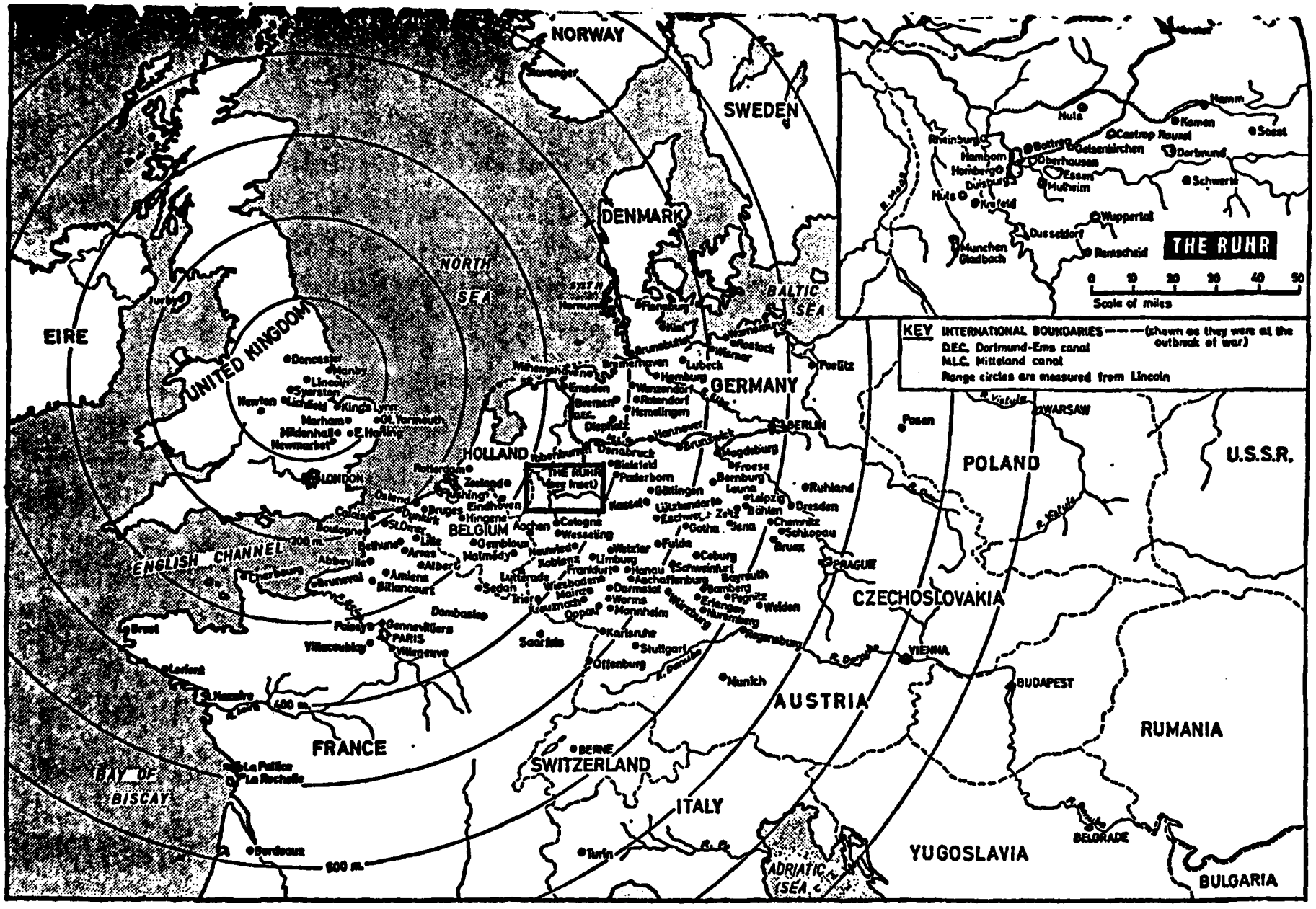

MAP 1: THE EUROPEAN THEATRE (8:xiii)

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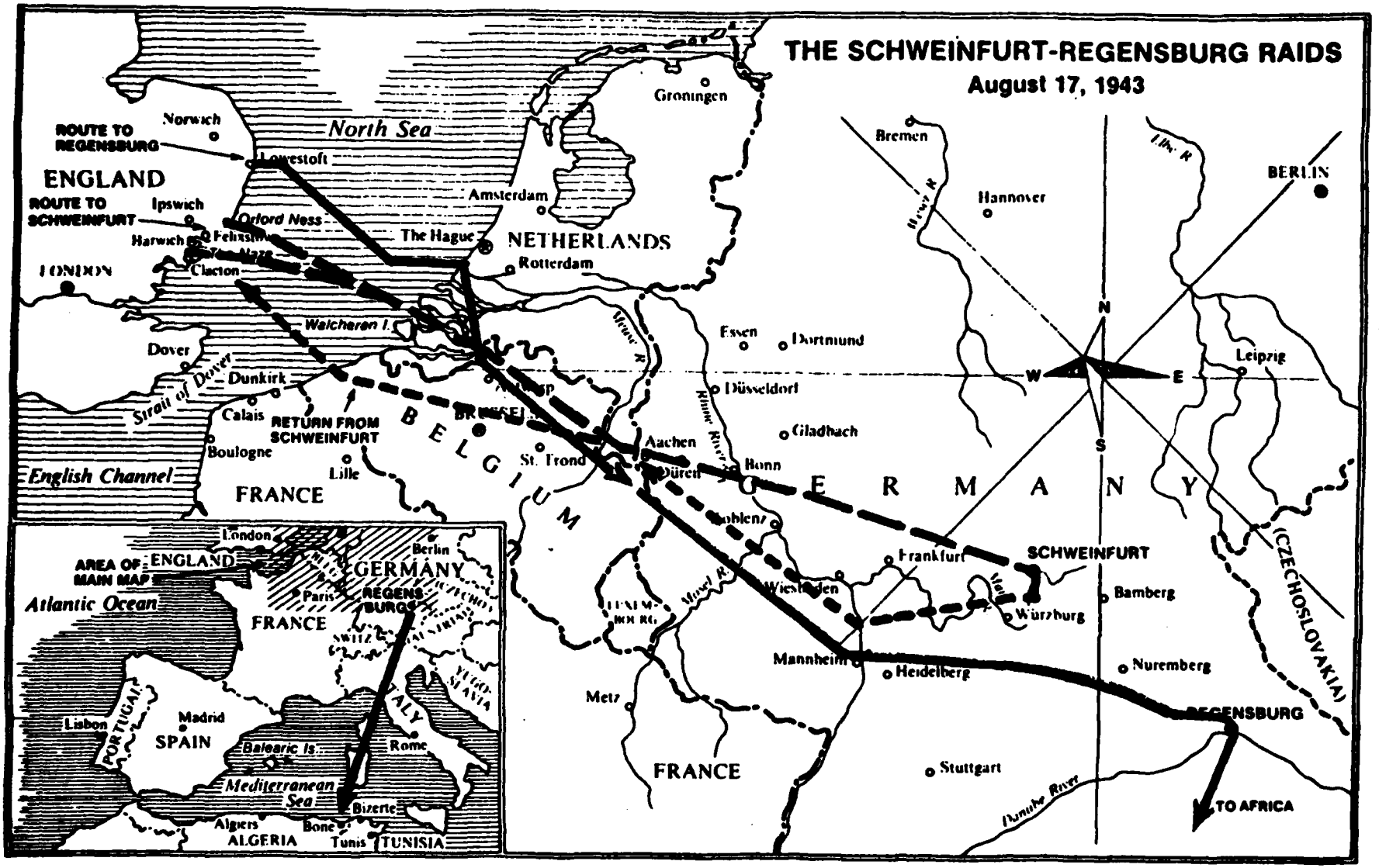

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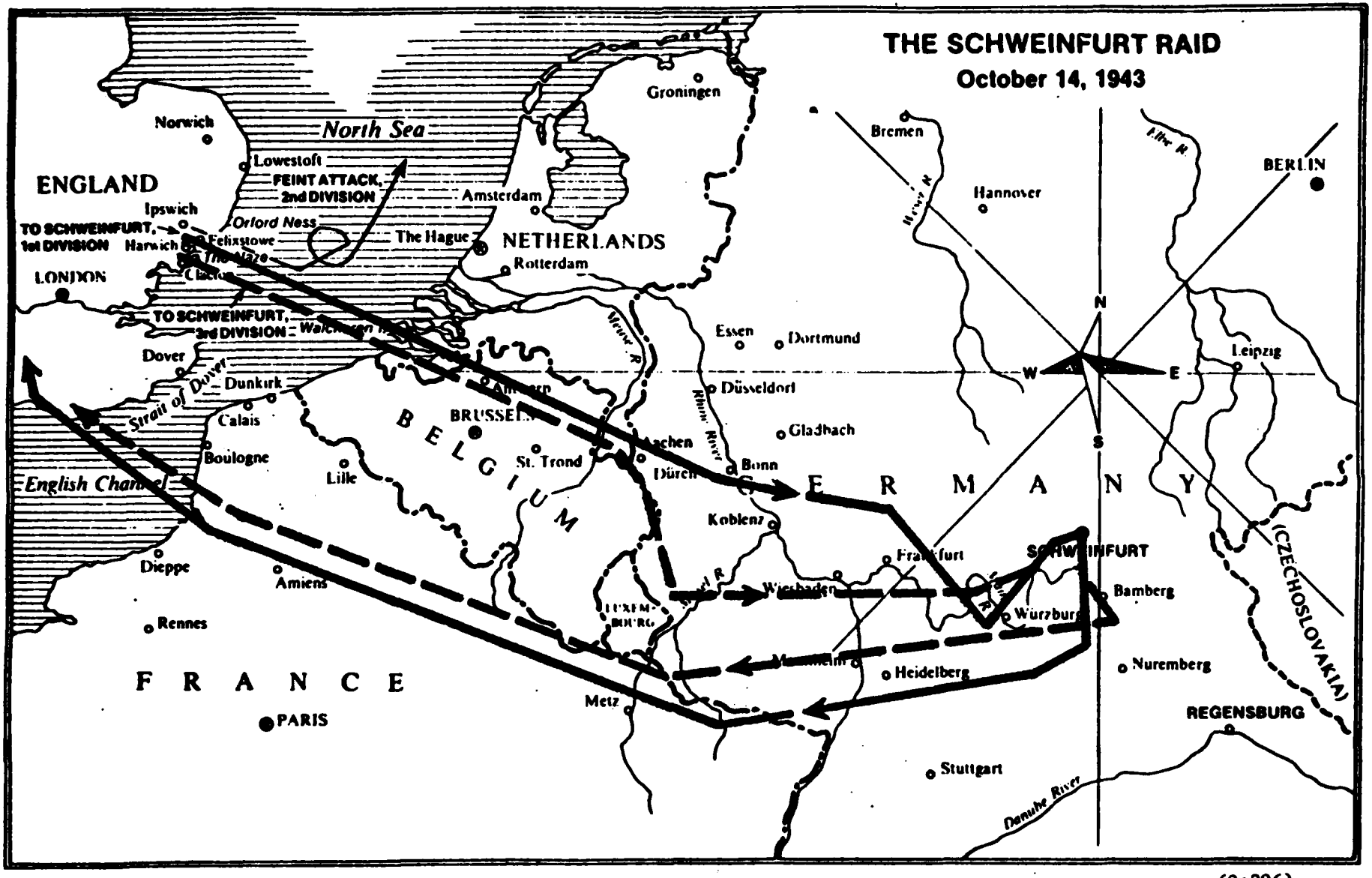
MAP 2: ROUTE OF FLIGHT, 17 AUGUST 1943 (2:2)



MAP 3: ROUTE OF FLIGHT, 14 OCTOBER 1943

(2:296)